Fig.1

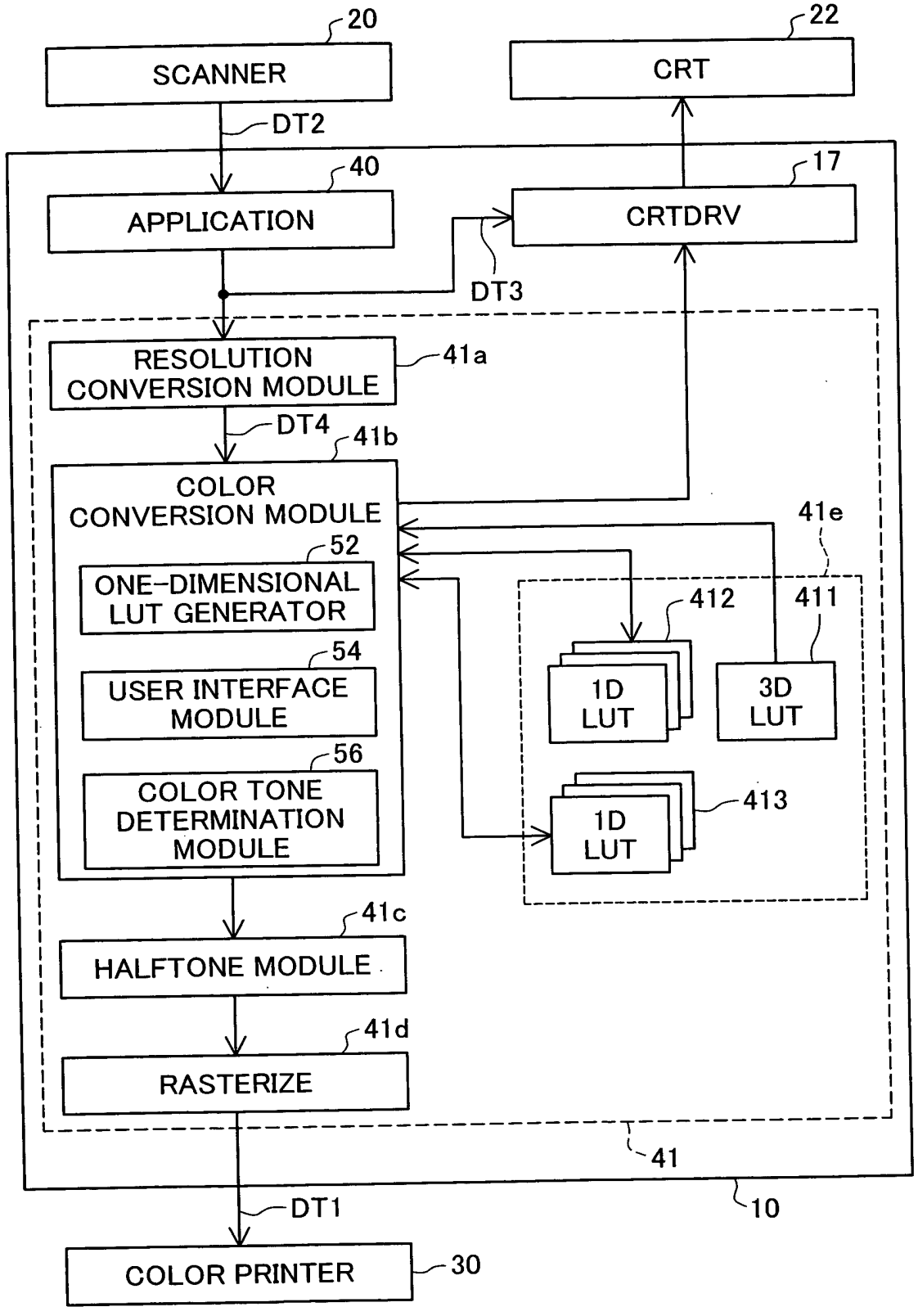

20
SCANNER
22
CRT
DT2
40
APPLICATION
17
CRTDRV
DT3
RESOLUTION CONVERSION MODULE
41a
DT4
41b
COLOR CONVERSION MODULE
41e
52
ONE-DIMENSIONAL LUT GENERATOR
412
411
54
USER INTERFACE MODULE
1D LUT
3D LUT
56
COLOR TONE DETERMINATION MODULE
413
1D LUT
41c
HALFTONE MODULE
41d
RASTERIZE
41
10
DT1
COLOR PRINTER
30

Fig.2

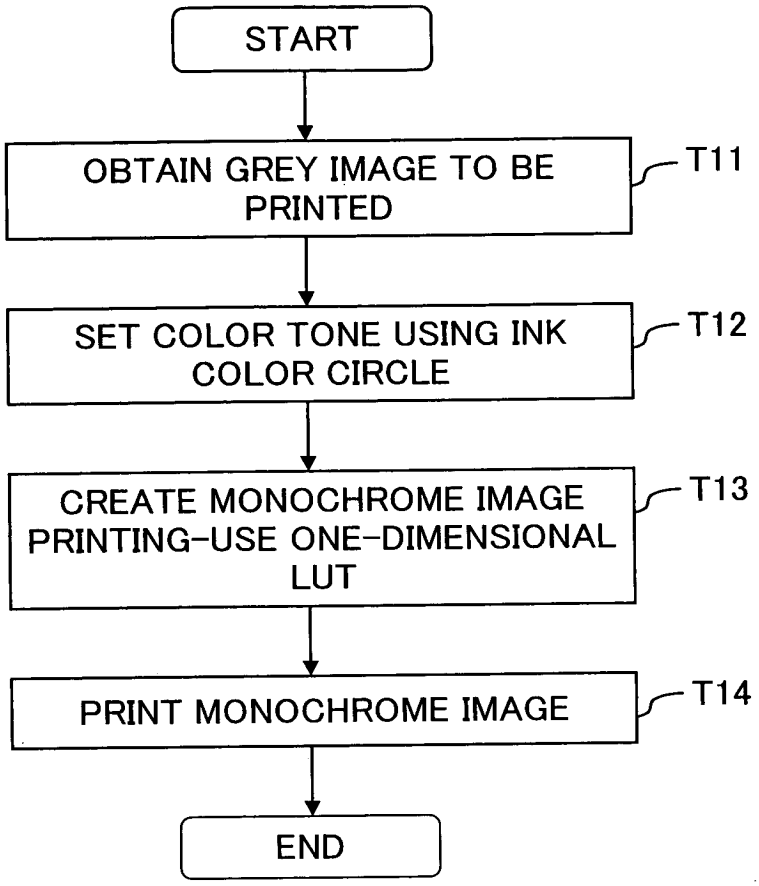

START
OBTAIN GREY IMAGE TO BE PRINTED
T11
SET COLOR TONE USING INK COLOR CIRCLE
T12
CREATE MONOCHROME IMAGE PRINTING-USE ONE-DIMENSIONAL LUT
T13
PRINT MONOCHROME IMAGE
T14
END

Fig.3A

Image to be printed

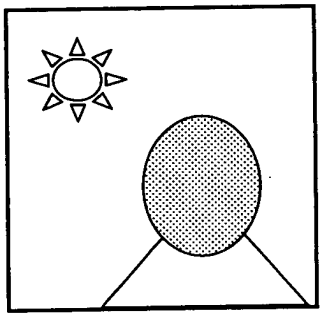


Fig.3B

Color tone setting

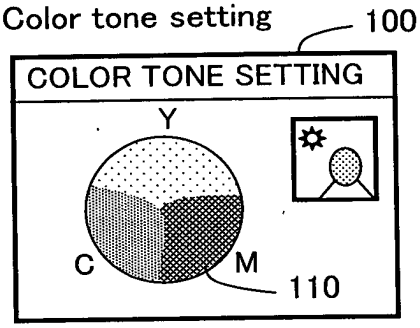



Fig.3C

Reference one-dimensional LUT 412

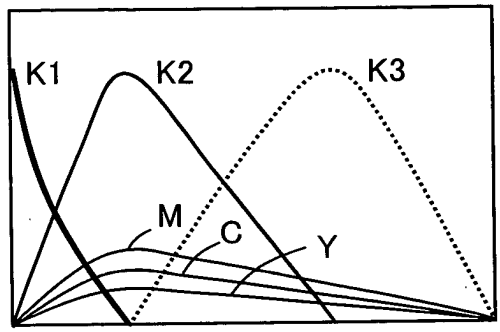
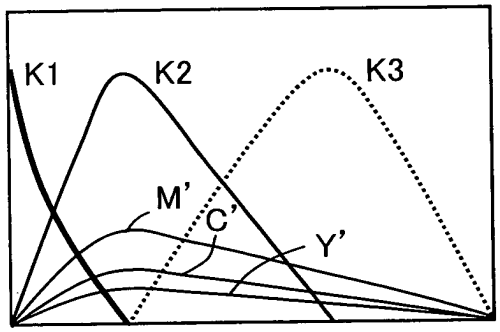



Fig.3D

Monochrome image printing-use one-dimensional LUT 413




$C' = C \times (Cv / Cmax)$
$M' = M \times (Mv / Mmax)$
$Y' = Y \times (Yv / Ymax)$

Fig.3E

Monochrome image printing

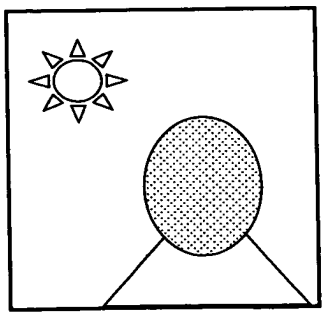


Fig.4

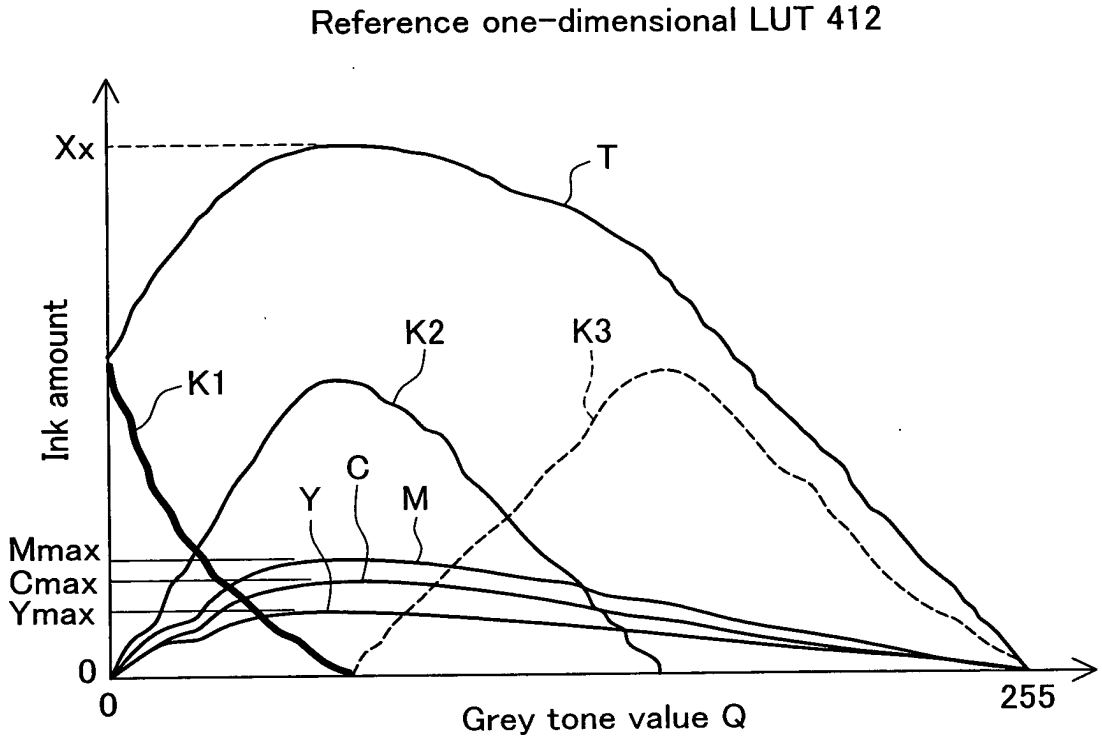

Reference one-dimensional LUT 412
Xx
T
K2
K3
K1
Ink amount
C
Y
M
Mmax
Cmax
Ymax
0
0
255
Grey tone value Q

Fig.5

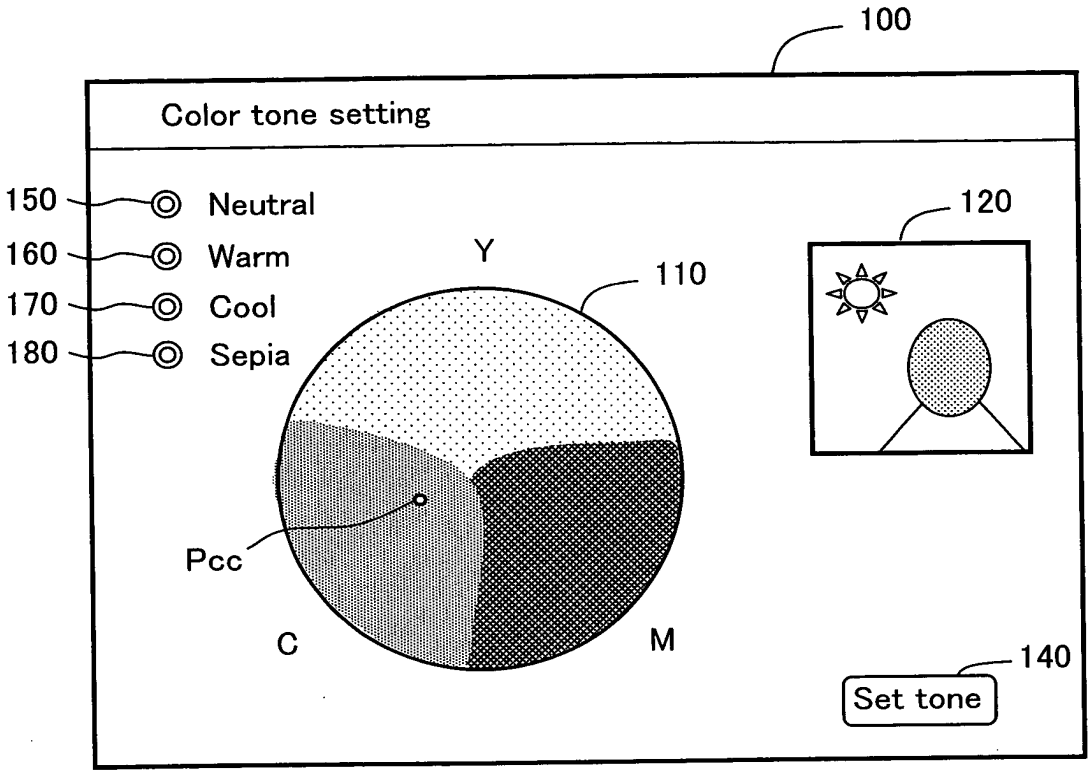
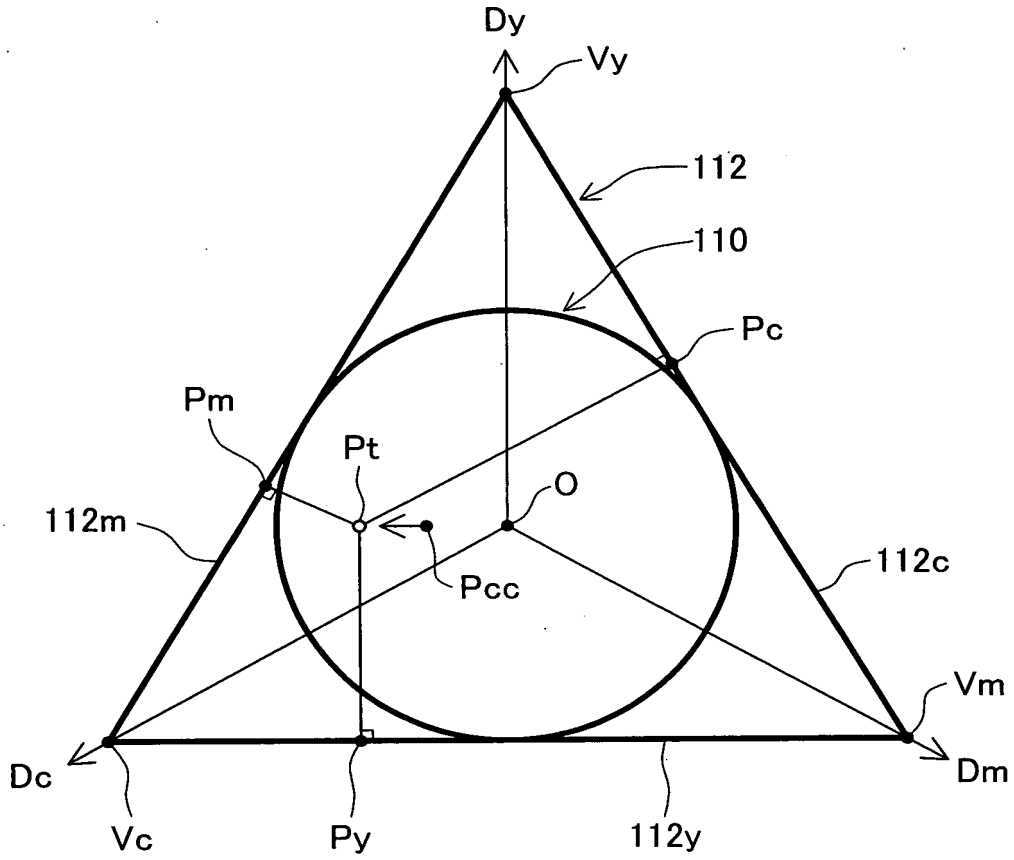

100
Color tone setting
150
Neutral
160
Warm
170
Cool
180
Sepia
Y
110
120
Pcc
C
M
140
Set tone

Fig.6




Color component intensity values Ic, Im, Iy for a point Pt corresponding to an arbitrary point Pcc in ink color circle:

$$Ic = \frac{Qc}{Qc + Qm + Qy}$$

$$Im = \frac{Qm}{Qc + Qm + Qy}$$

$$Iy = \frac{Qy}{Qc + Qm + Qy}$$

$$Qc = \overline{PtPc}\,,\ Qm = \overline{PtPm}\,,\ Qy = \overline{PtPy}$$

Fig.7A

Relationship between color component intensity value Ic and tone adjustment value Cv

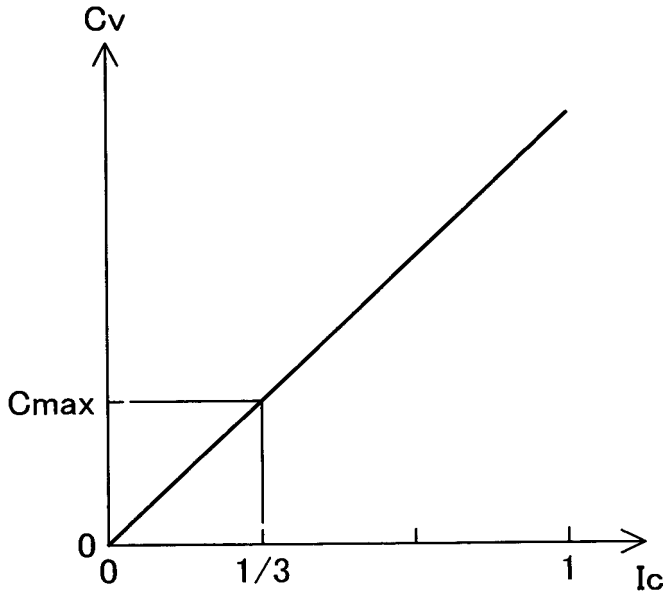



Fig.7B

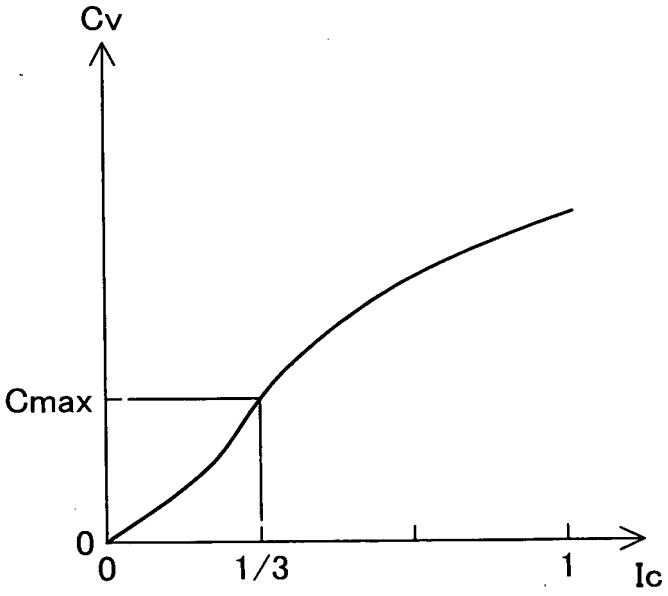


Fig.8

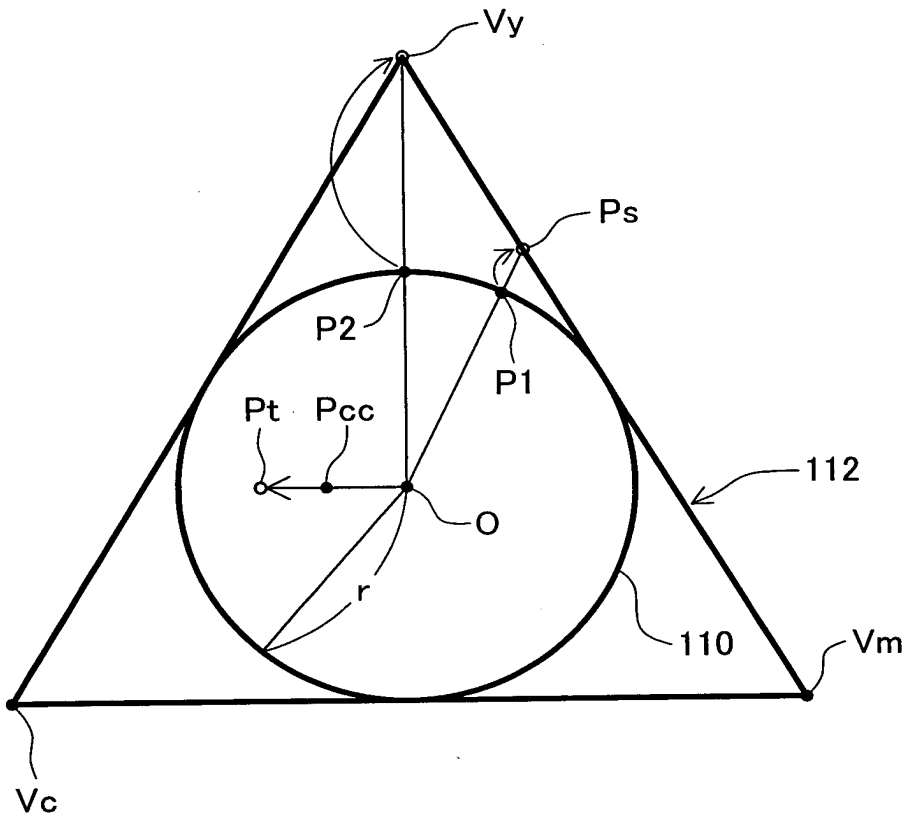


Fig.9A

Linear conversion

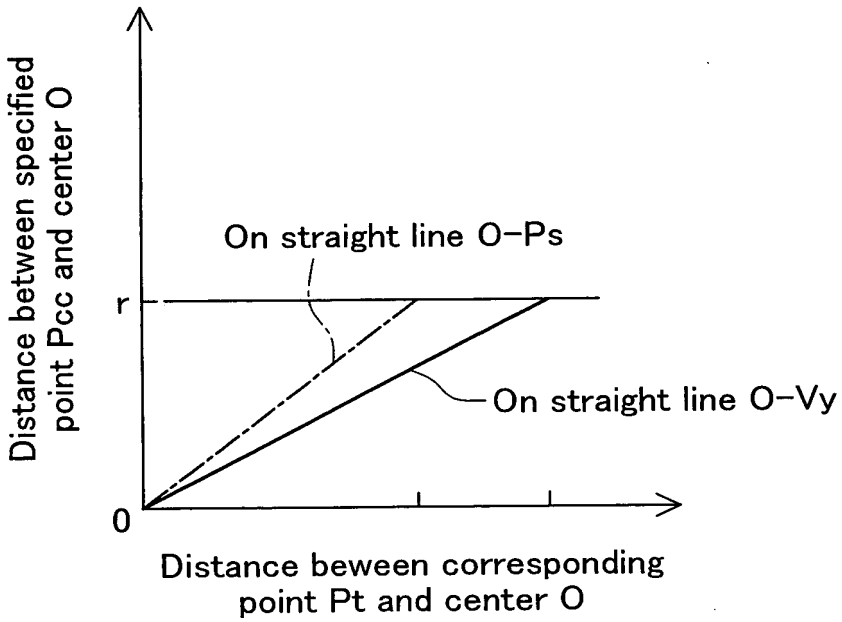



Fig.9B

Non-linear conversion

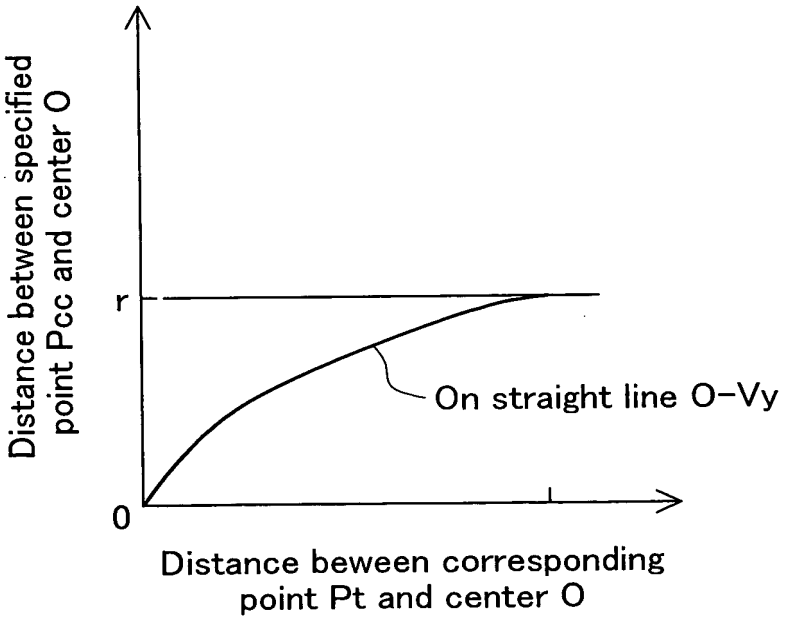
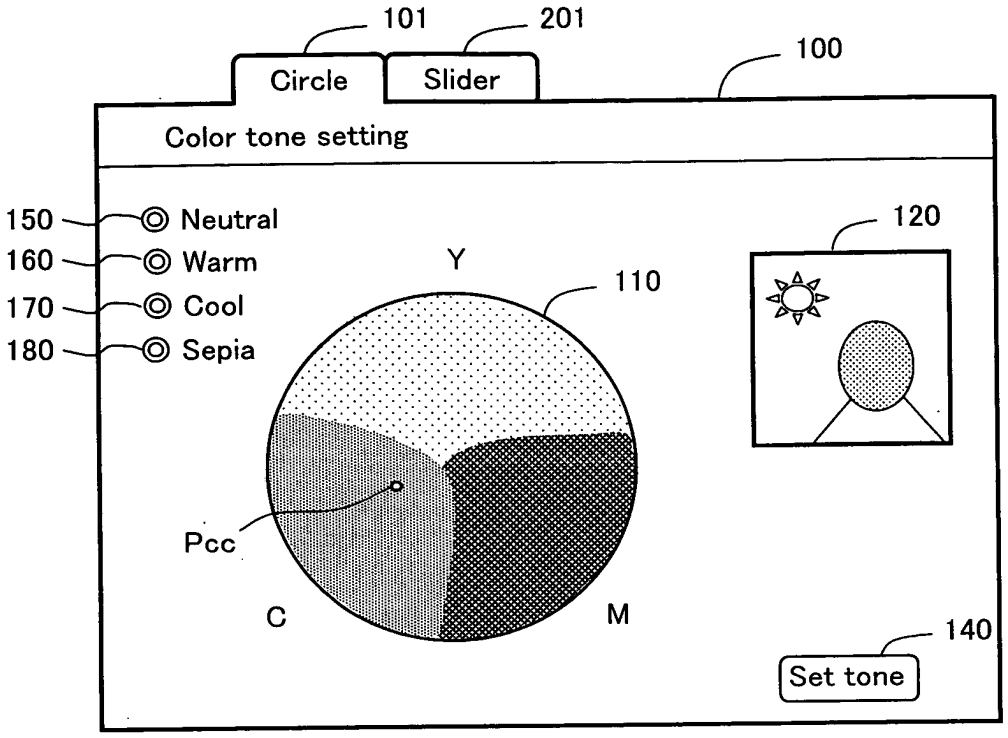


Fig.10A

Color circle display




Permissible

Non-permissible

Fig.10B

Color slider display

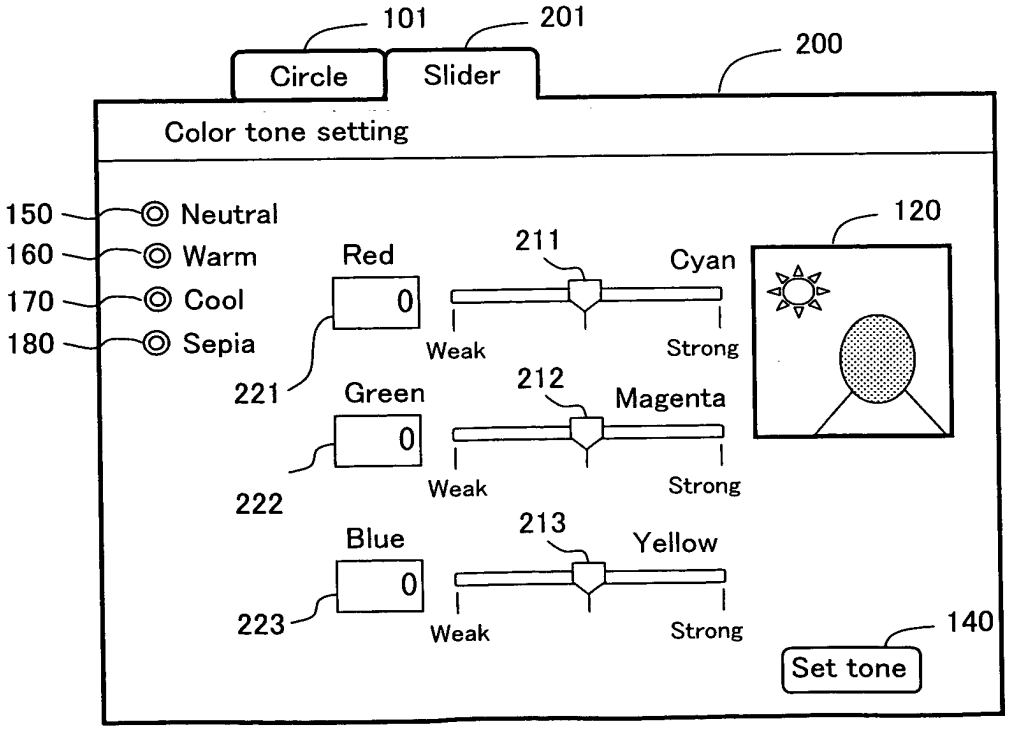
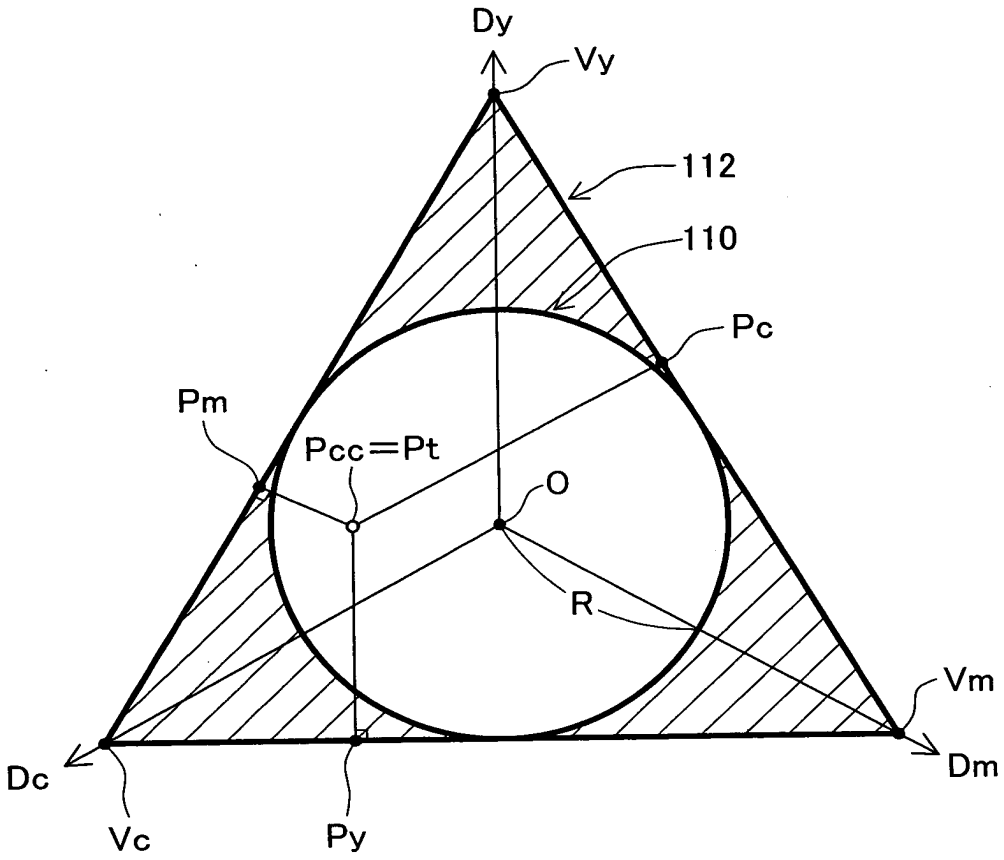


Fig.11




Color component intensity values Ic, Im, Iy for an arbitrary point Pcc (=Pt) in ink color circle

$$Ic = \frac{Qc}{2R}$$

$$Im = \frac{Qm}{2R}$$

$$Iy = \frac{Qy}{2R}$$

$$Qc = \overline{PtPc}\ ,\ Qm = \overline{PtPm}\ ,\ Qy = \overline{PtPy}$$

Fig.12A

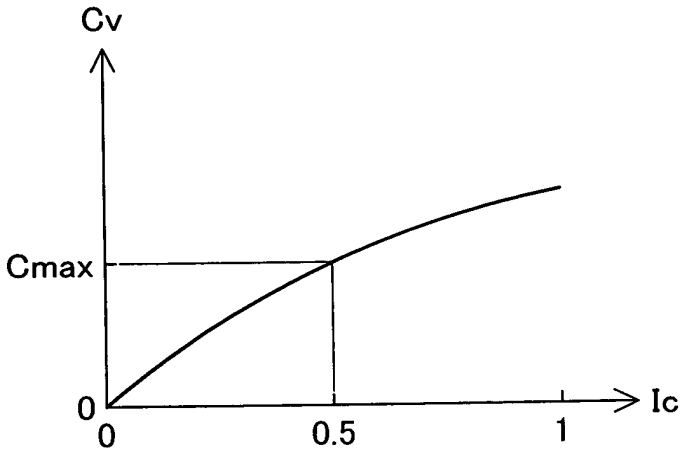



Fig.12B

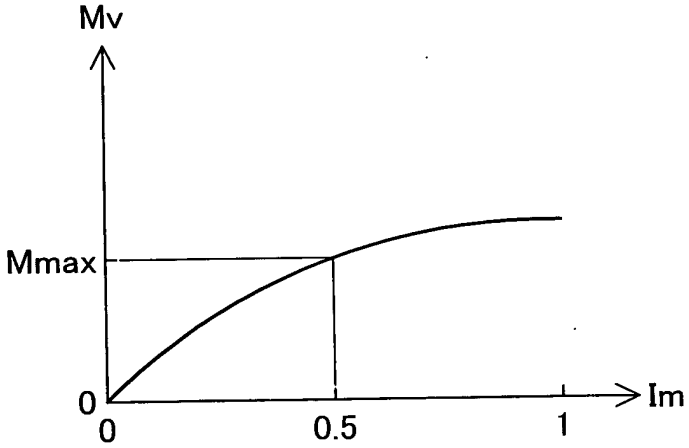



Fig.12C

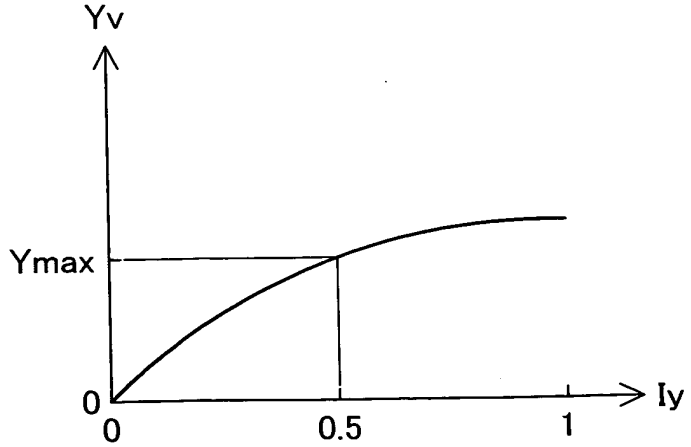


Fig.13

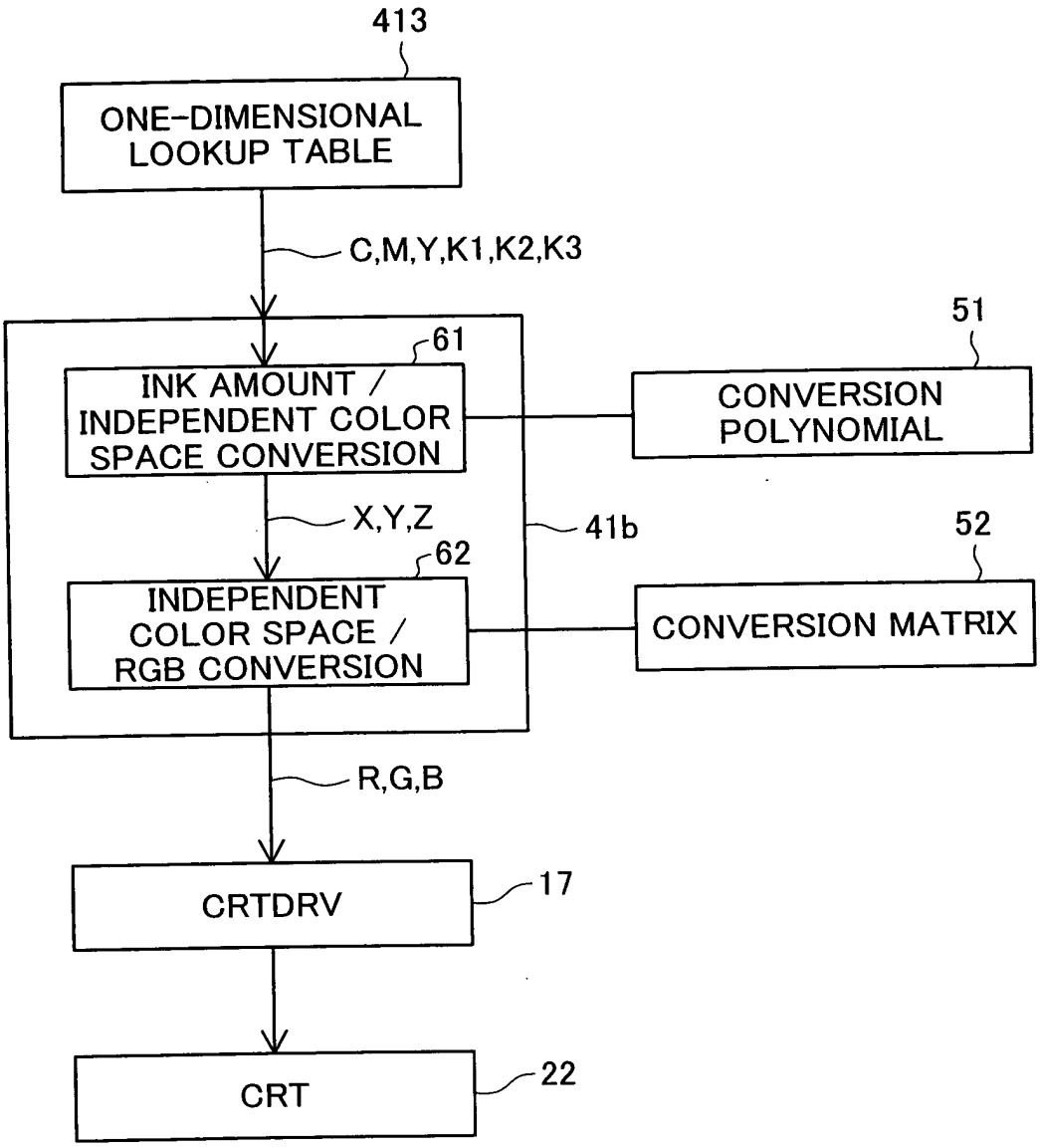

413
ONE-DIMENSIONAL LOOKUP TABLE
C,M,Y,K1,K2,K3
61
INK AMOUNT / INDEPENDENT COLOR SPACE CONVERSION
51
CONVERSION POLYNOMIAL
X,Y,Z
41b
62
INDEPENDENT COLOR SPACE / RGB CONVERSION
52
CONVERSION MATRIX
R,G,B
CRTDRV
17
CRT
22

Fig.14A

Reference one-dimensional LUT 412a (eight ink colors)

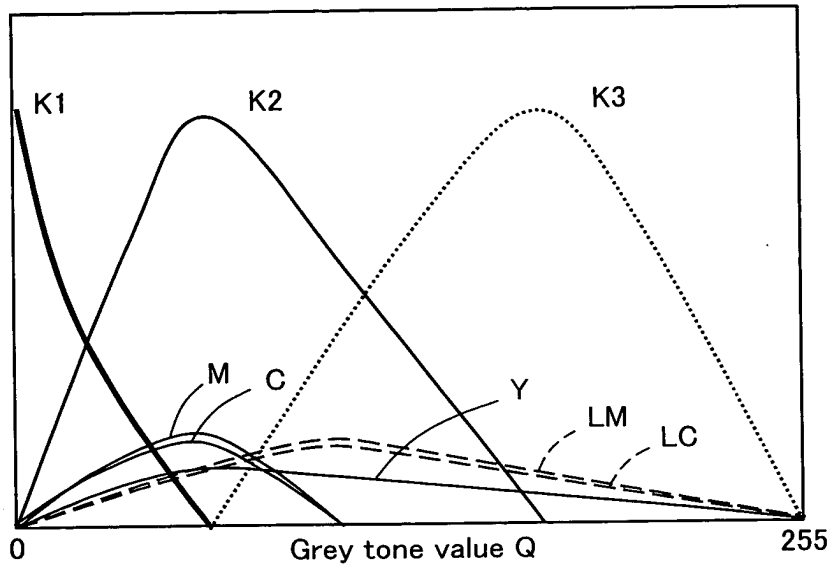
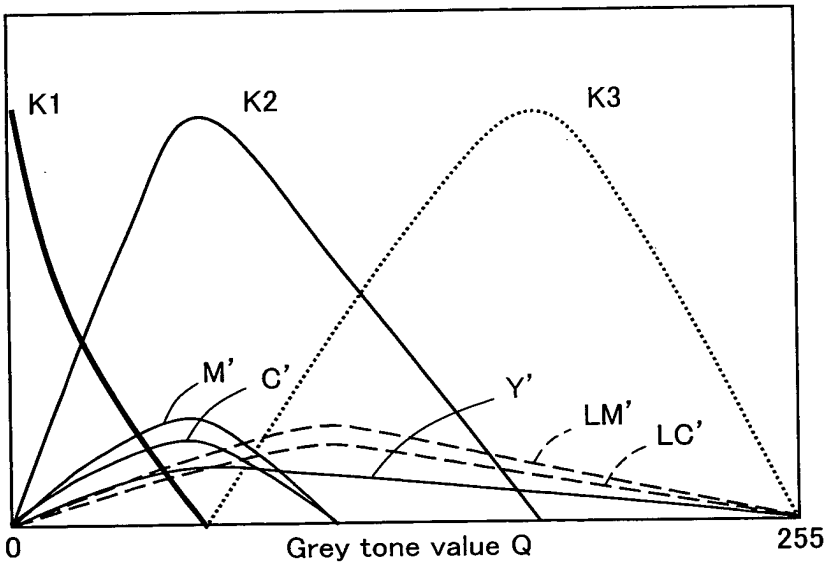



Fig.14B

Monochrome image printing-use one-dimensional LUT 413a (eight ink colors)




$$C' = C \times (Cv / Cmax)$$
$$LC' = LC \times (Cv / Cmax)$$
$$M' = M \times (Mv / Mmax)$$
$$LM' = LM \times (Mv / Mmax)$$
$$Y' = Y \times (Yv / Ymax)$$

Fig.15A

Reference one-dimensional LUT 412 (six ink colors)

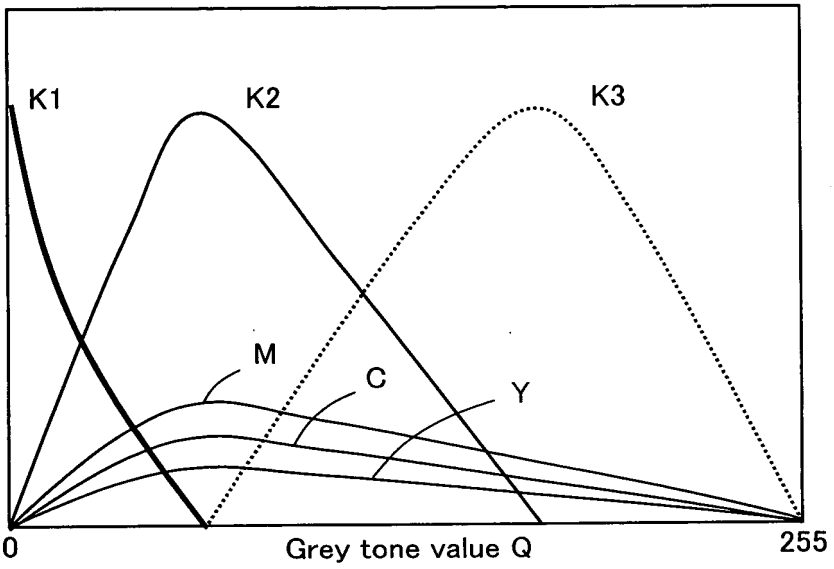
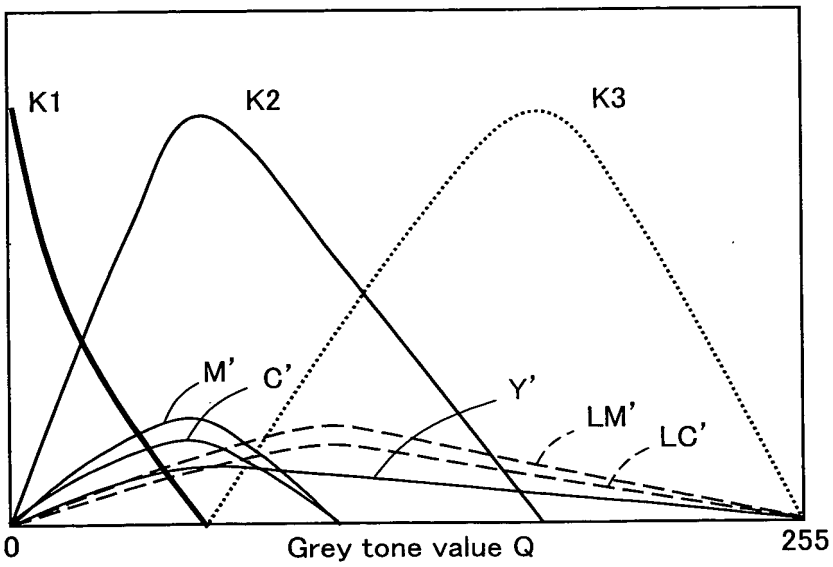



Fig.15B

Monochrome image printing-use one-dimensional LUT 413A
(eight ink colors)




$$C' = \alpha C \times (Cv/Cmax)$$
$$LC' = k1\ (1-\alpha)\ C \times (Cv/Cmax)$$
$$M' = \beta M \times (Mv/Mmax)$$
$$LM' = k2\ (1-\beta)\ M \times (Mv/Mmax)$$
$$Y' = Y \times (Yv/Ymax)$$

Fig.16

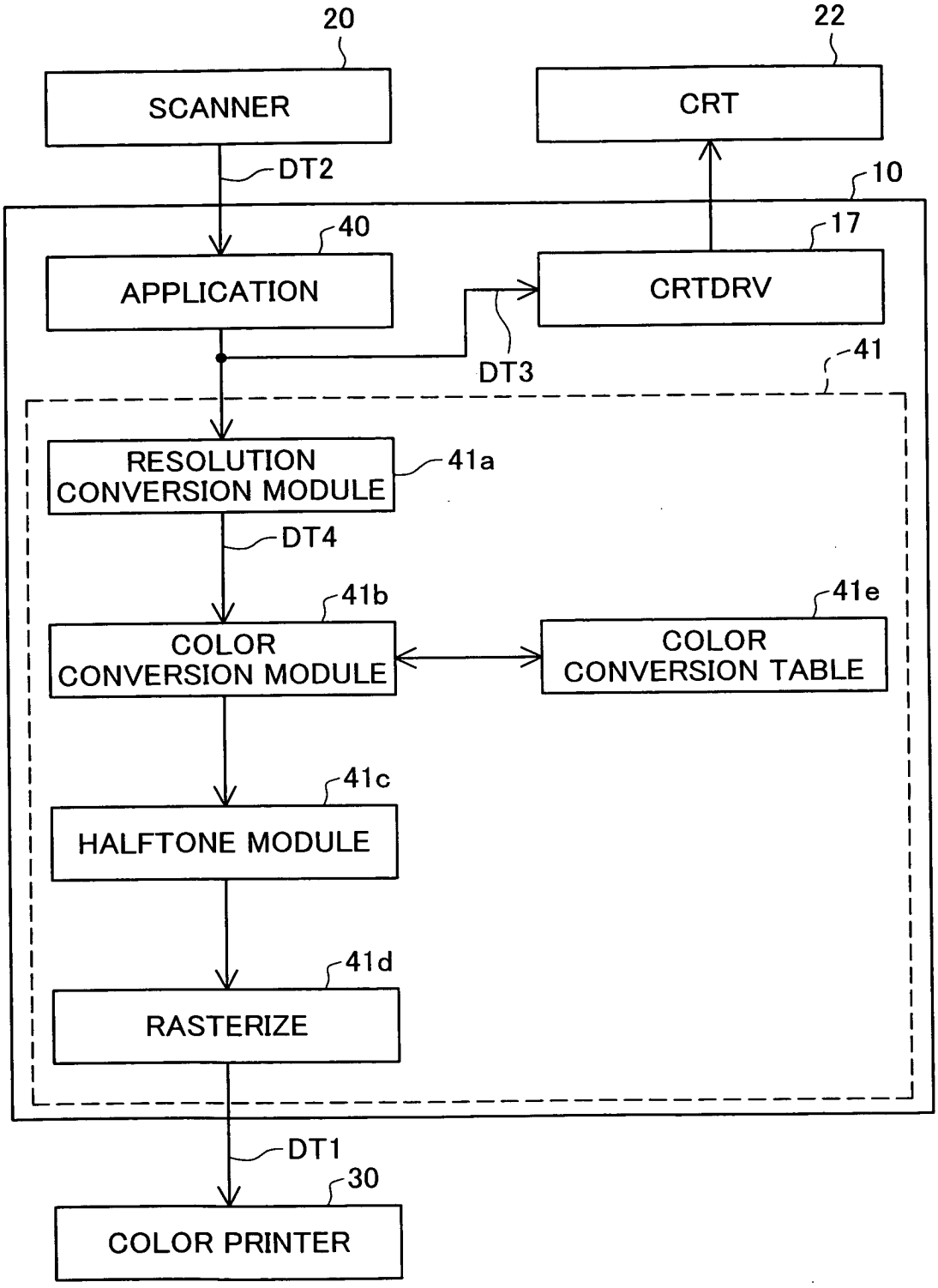

20
SCANNER
22
CRT
DT2
10
40
APPLICATION
17
CRTDRV
DT3
41
RESOLUTION CONVERSION MODULE
41a
DT4
41b
COLOR CONVERSION MODULE
41e
COLOR CONVERSION TABLE
41c
HALFTONE MODULE
41d
RASTERIZE
DT1
30
COLOR PRINTER

Fig.17

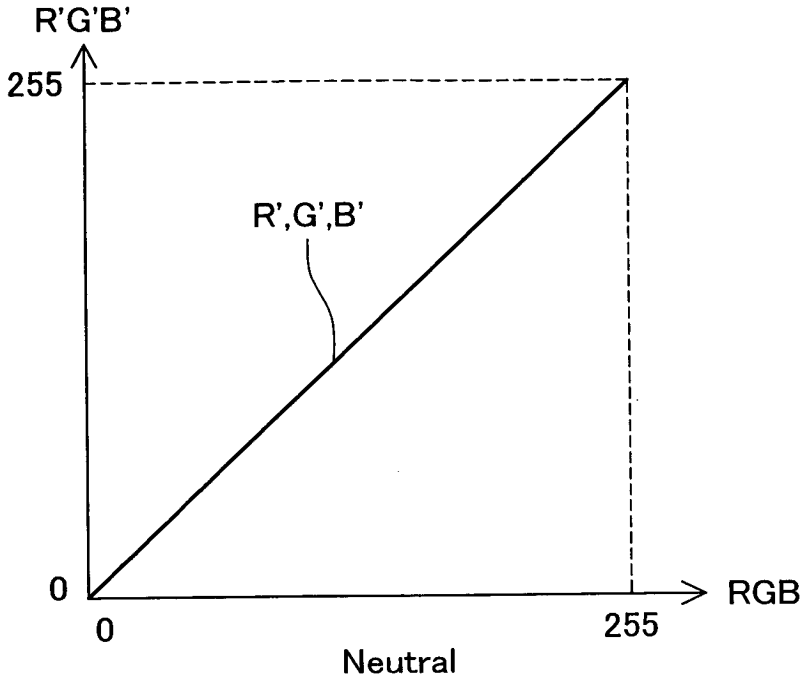



Fig.18

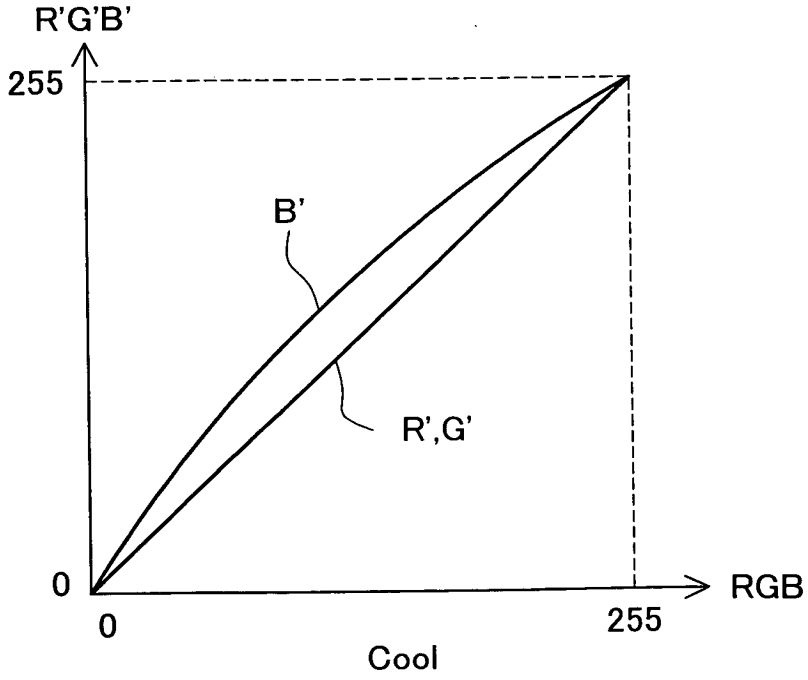


Fig.19

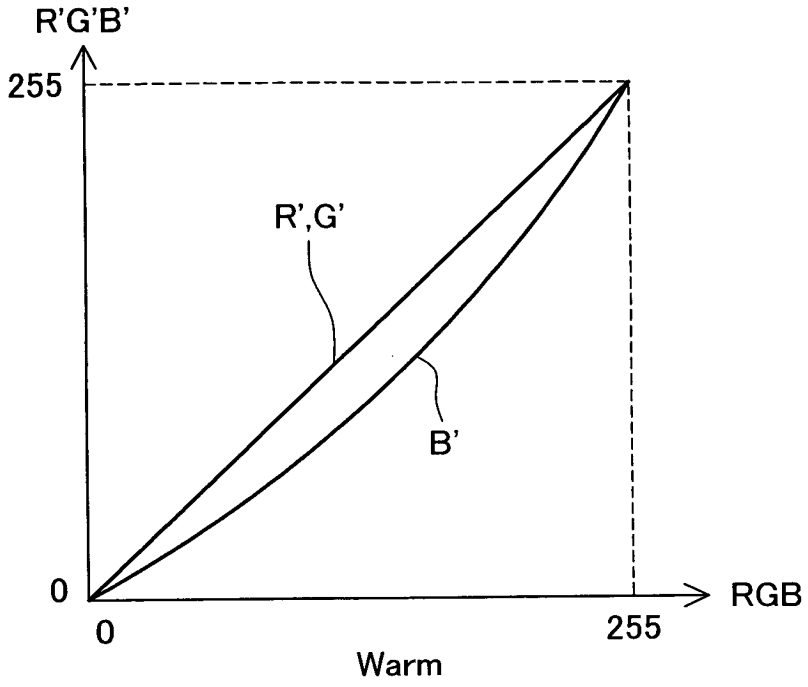



Fig.20

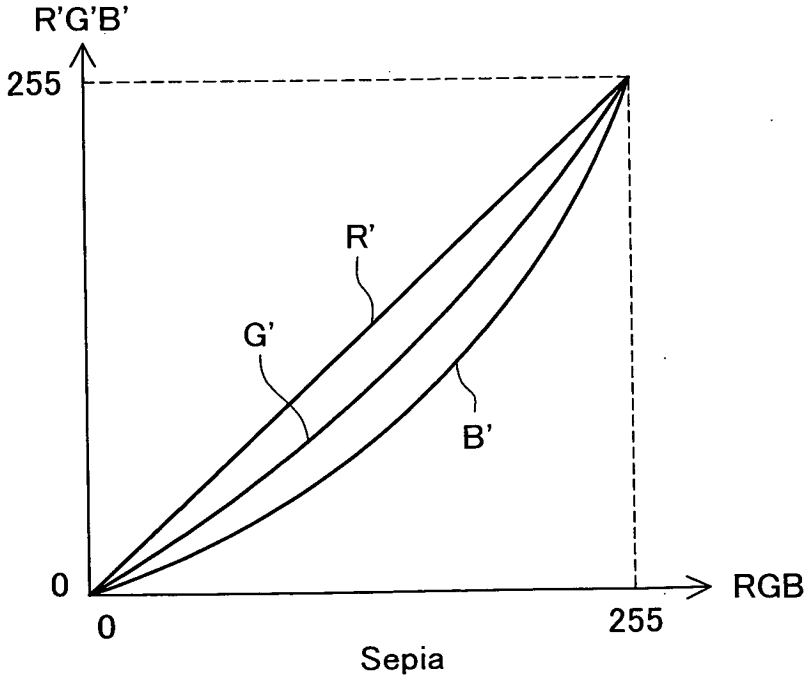


Fig.21